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# PATENT ABSTRACTS OF JAPAN

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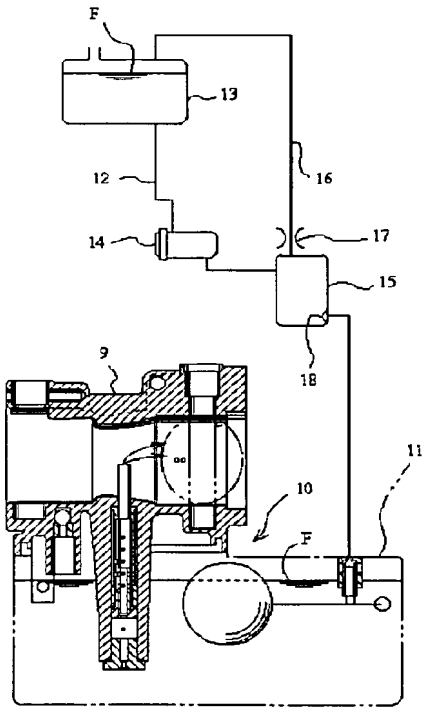
## (54) VAPOR REMOVING DEVICE IN FUEL FEED SYSTEM OF INTERNAL COMBUSTION ENGINE

(57)Abstract:




PROBLEM TO BE SOLVED: To provide a vapor removing device in a fuel feed system of an internal combustion engine capable of removing vapor produced in the fuel feed system by surely leading to a fuel tank.

SOLUTION: In the fuel feed system comprising a fuel feed route 19 allowing the fuel feed device (10) of the internal combustion engine to communicate with the fuel tank 20 and a vapor return route 23 branched from the intermediate part of the fuel feed route and allowed to communicate with the fuel tank, a surface tension generating member 25 is installed at the branched part of the fuel feed route and the vapor return route so as to cover the opening part communicating with the fuel feed device.

[Claim(s)]

[Claim 1] The vapor stripper in the fuel-supply system of the internal combustion engine characterized by to be prepared in the tee of said fuel-supply path and said vapor return path in the fuel-supply system which consists of a fuel-supply path which opens an internal combustion engine's fuel supply system and fuel tank for free passage, and a vapor return path which branched from the middle of this fuel-supply path, and was made open for free passage to said fuel tank, to cover opening which is open for free passage to said fuel supply system, and to prepare the surface-tension generating member.

[Claim 2] The vapor stripper in the fuel-supply system of the internal combustion engine according to claim 1 characterized by forming in the lower part of said vapor separate tank opening which is open for free passage to said fuel supply system, covering this opening, and preparing said surface tension generating member while the vapor separate tank which stores the fuel supplied from said fuel tank temporarily is formed in said tee and said vapor return path is connected to it in the upper part of this vapor separate tank.

[Claim 3] The vapor stripper in the fuel-supply system of an internal combustion engine given in any of claim 1 characterized by equipping said fuel supply system with a carburetor, and connecting the fuel-supply path from said tee to the float chamber of said carburetor, or claim 2 they are.

[Claim 4] The vapor stripper in the fuel-supply system of the internal combustion engine according to claim 1 characterized by equipping said fuel supply system with the fuel injection equipment which injects said fuel, and forming said tee in this fuel injection equipment.

[Claim 5] The vapor stripper in the fuel-supply system of an internal combustion engine given in any of claim 1 characterized by forming the fuel pump between said fuel tanks and said tees of said fuel-supply path thru/or claim 4 they are.

[Claim 6] The vapor stripper in the fuel-supply system of an internal combustion engine given in any of claim 1 characterized by being the sheet with which said surface tension generating member consists of paper which has continuation pore thru/or claim 5 they are.

[Claim 7] The vapor stripper in the fuel-supply system of an internal combustion engine given in any of claim 1 to which said surface tension generating member is characterized by being a metal perforated plate thru/or claim 5 they are.

[Claim 8] The vapor stripper in the fuel-supply system of an internal combustion engine given in any of claim 1 characterized by said surface tension generating member being the sintered compact which has continuation pore thru/or claim 5 they are.

[Claim 9] The vapor stripper in the fuel-supply system of an internal combustion engine given in any of claim 1 to which said surface tension generating member is characterized by being a non woven fabric thru/or claim 5 they are.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the vapor stripper in an internal combustion engine's fuel-supply system.

[0002]

[Description of the Prior Art] Conventionally, as an internal combustion engine, as shown in drawing 5 , the thing equipped with the carburetor 1 of a fixed venturi mold is known. And the fuel-supply system which supplies the fuel F currently stored by the fuel tank 2 to said carburetor 1 is prepared in said carburetor 1.

[0003] Said fuel-supply system is equipped with the fuel-supply path 4 which opens for free passage the float chamber 3 prepared in said fuel tank 2

and said carburetor 1, and the fuel pump 5 which supplies said fuel F to said float chamber 3 from said fuel tank 2 is formed in this fuel-supply path 4.

[0004] On the other hand, by such fuel-supply system, in case Fuel F is attracted in said fuel pump 5, air bubbles may be generated with the negative pressure in the fuel F to attract. The air bubbles which the gas of the up space in said float chamber 3 mixes these air bubbles into Fuel F by the vapor generated in Fuel F by the rise of the ambient temperature accompanying an engine's temperature rise and vibration of an engine, and are formed are contained. And if air bubbles and vapor occur in this way, it will be assumed that such air bubbles and vapor will be supplied to said carburetor 1 through said float chamber 3 with said fuel F, but if the fuel F which air bubbles and vapor mixed is supplied to a carburetor 1, the problem that the air-fuel ratio of the gaseous mixture generated in this carburetor 1 becomes unstable, and the problem of an internal combustion engine's poor restart will occur.

[0005] Then, the conditions of a thermal ambient atmosphere are bad. Or are easy to be influenced of vibration and it sets to the internal combustion engine which a lot of vapor or air bubbles generate. In the middle of said fuel-supply path 4, form the vapor separate tank 6 which stores the fuel F sent in from this fuel pump 5 temporarily in the downstream of said fuel pump 5, and it sets in this vapor separate tank 6. While dividing said vapor and air bubbles into the upper part of said vapor separate tank 6 using that buoyancy, he is trying to discharge said vapor and air bubbles to said fuel tank 2 through the vapor return path 7 prepared in the upper part of this vapor separate tank 6.

[0006]

[Problem(s) to be Solved by the Invention] By the way, the following troubles which should be improved are left behind in such a conventional internal combustion engine's fuel-supply system. Namely, although it is separated by the buoyancy of vapor or the air bubbles itself while Fuel F is stored in said vapor separate tank 6, said vapor and air bubbles For example, if said vapor separate tank 6 is shaken by vibration of an internal combustion engine etc. It is the trouble that the fuel F currently stored will be agitated, separation of said vapor or air bubbles will not be performed, but these vapor and air bubbles will be sent into said carburetor 1 with Fuel F.

[0007] This invention was made in view of such a conventional trouble, and aims at offering the vapor stripper in the fuel-supply system of the possible internal combustion engine of leading certainly the vapor generated in a fuel-supply system to a fuel tank, and removing it.

[0008]

[Means for Solving the Problem] The vapor stripper in the fuel-supply system of the internal combustion engine of this invention according to claim 1 The fuel-supply path which opens an internal combustion engine's fuel supply system and fuel tank for free passage in order to attain the purpose mentioned above, In the fuel-supply system which consists of a vapor return path which branched from the middle of this fuel-supply path, and was made open for free passage to said fuel tank It is characterized by being prepared in the tee of said fuel-supply path and said vapor return path, covering opening which is open for free passage to said fuel supply system, and preparing the surface tension generating member. The vapor stripper in the fuel-supply system of the internal combustion engine of this invention according to claim 2 While the vapor separate tank which stores the fuel supplied from said fuel tank temporarily is formed in said tee according to claim 1 and said vapor return path is connected to it in the upper part of this vapor separate tank It is characterized by forming in the lower part of said vapor separate tank opening which

is open for free passage to said fuel supply system, covering this opening, and preparing said surface tension generating member. Said fuel supply system given in any of claim 1 or claim 2 they are is equipped with a carburetor, and the vapor stripper in the fuel-supply system of the internal combustion engine of this invention according to claim 3 is characterized by connecting the fuel-supply path from said tee to the float chamber of said carburetor. Said fuel supply system according to claim 1 is equipped with the fuel injection equipment which injects said fuel, and the vapor stripper in the fuel-supply system of the internal combustion engine of this invention according to claim 4 is characterized by forming said tee in this fuel injection equipment. The vapor stripper in the fuel-supply system of the internal combustion engine of this invention according to claim 5 is characterized by forming the fuel pump between said fuel tanks and said tees of said fuel-supply path given in any of claim 1 thru/or claim 4 they are. The vapor stripper in the fuel-supply system of the internal combustion engine of this invention according to claim 6 is characterized by being the sheet with which said surface tension generating member given in any of claim 1 thru/or claim 5 they are consists of paper which has continuation pore. The vapor stripper in the fuel-supply system of the internal combustion engine of this invention according to claim 7 is characterized by said surface tension generating member given in any of claim 1 thru/or claim 5 they are being a metal perforated plate. The vapor stripper in the fuel-supply system of the internal combustion engine of this invention according to claim 8 is characterized by said surface tension generating member given in any of claim 1 thru/or claim 5 they are being the sintered compact which has continuation pore. The vapor stripper in the fuel-supply system of the internal combustion engine of this invention according to claim 9 is characterized by said surface tension generating member given in any of claim 1 thru/or claim 5 they are being a non woven fabric.

[0009]

[Embodiment of the Invention] Hereafter, 1 operation gestalt of this invention is explained with reference to drawing 1 . Drawing 1 shows the fuel-supply system of the internal combustion engine with which this operation gestalt was applied, and the sign 10 in drawing shows the carburetor as a fuel supply system which supplies gaseous mixture to an internal combustion engine.

[0010] Said carburetor 10 is equipped with the main body 9 with which inhalation-of-air path 11a was formed. The float chamber 11 in which Fuel F is stored is formed in the lower part of this main body 9, and the fuel tank 13 is made open for free passage by this float chamber 11 through the fuel-supply path 12.

[0011] The fuel pump 14 which sends into the float chamber 11 of said carburetor 10 the fuel F currently stored in said fuel tank 13 in the middle of said fuel-supply path 12 is formed, and the vapor separate tank 15 which stores the fuel F sent into this float chamber 11 temporarily is formed between this fuel pump 14 and said float chamber 11.

[0012] And while said fuel pump 14 is opened for free passage by the upper part, said float chamber 11 is made to open said vapor separate tank 15 for free passage by the lower part. Moreover, the vapor return path 16 of making the up space section of said fuel tank 13 opening this vapor separate tank 15 for free passage is connected to the upper part of said vapor separate tank 15. While discharging the vapor and the air bubbles which were separated from Fuel F in said vapor separate tank 15 to said fuel tank 13 for this vapor return path 16 using that buoyancy, the surplus fuel F which was prepared in that middle and which

extracted and was measured by 17 is returned to said fuel tank 13.

[0013] On the other hand in this operation gestalt, opening which is open for free passage to said fuel supply system (carburetor 10) of the tee 15 of said fuel-supply path 12 and said vapor return path 16, i.e., said vapor separate tank, is covered, and the surface tension generating member 18 is formed.

[0014] Said surface tension generating member 18 is a sheet which consists of paper which has for example, continuation pore, are metal perforated plates, such as a punching plate and a network, or is the sintered compact and nonwoven fabric which have continuation pore.

[0015] Here, said surface tension generating member 25 is explained in full detail with reference to drawing 2 . This surface tension generating member 18 has much pore 18a (one piece represented in drawing 2 was shown), and is passed by Fuel F through such pore 18a. Here, in the condition that the both sides of said surface tension generating member 18 are made full with Fuel F, as shown in drawing 2 , as shown in drawing 2 (a), pore 18a of the surface tension generating member 18 is passed for said fuel F by the difference (deltaP) of the pressure of the upstream, and the pressure of the downstream. On the other hand, as shown in drawing 2 (b), when Vapor V invades into said pore 18a, the oil level of Fuel F is formed in the downstream of this pore 18a, surface tension occurs on this oil level, this surface tension is resisting, and passage of said vapor V is prevented. And in order for said vapor V to pass said surface tension generating member 18, it is required for said differential pressure deltaP to be, more than 1 [ discharge-pressure P] it overcomes said surface tension. Therefore, as shown in drawing 2 (c), in the range smaller than a discharge pressure P1, passage of Vapor V does not have differential pressure delta P of the both sides of the surface-tension generating member 18, and passage of Fuel F will be performed. In this drawing 2 (c), Q shows a passage air content.

[0016] Thus, in this operation gestalt, even if Fuel F and air bubbles are agitated by vibration etc. and these air bubbles reach to opening by the side of a carburetor 10 by it in the tee 15 of the fuel-supply path 12 and the vapor return path 16, i.e., a vapor separate tank, it is prevented according to an operation of said surface tension generating member 18 that said air bubbles invade into a carburetor 10 side.

[0017] Drawing 3 shows the 2nd operation gestalt of this invention, is the thing using the fuel injection equipment 30 as said fuel-supply means, and prepares the tee of said fuel-supply path 19 and the vapor return path 23 in this fuel injection equipment 30.

[0018] The plunger pump P which it will be equipped with said fuel injection equipment 30 in the body 31 and this body 31, and will carry out suction feeding of said fuel F if it explains in full detail Said body 31 is equipped and it has the injection nozzle 32 which injects said fuel F. Said plunger pump P A cylinder 33, It consists of a plunger 35 with which it is equipped possible [ sliding ] and which forms a pressurized room 34 in this cylinder 33, and a solenoid coil 36 which excites this plunger 35. On said body 31 The contact pipe 37 for suction which constitutes said fuel-supply path 12 in the lower part is formed. In the upper part The contact pipe 38 for return which constitutes said vapor return path 16 is formed. Further between said cylinders 33 and solenoid coils 36 The ring current way 39 which turns and shows some fuels branched from said fuel-supply path 12 to said vapor return path 23 is formed.

[0019] Furthermore, suction way 33a which opens the contact pipe 37 for suction and said pressurized room 34 for free passage is formed in the tee of said fuel-supply path 12 and said ring current way 39 in the lower limit section of said

cylinder 33 **, and the inlet check valve 40 as a check valve which permits an inflow into said pressurized room 34 of said fuel F only at the time of the suction stroke of said plunger 35 is formed while being this suction way 33a.

[0020] And in this operation gestalt, opening of the entrance side of said suction way 33a is covered, and the surface tension generating member 41 is formed.

[0021] Thus, in the constituted fuel injection equipment 30, while attracting Fuel F through said inlet check valve 40 and sending this fuel F into said injection nozzle 32 with vertical movement of said plunger 35, it injects from this injection nozzle 32.

[0022] And if vapor is mixing into the fuel F supplied from said contact pipe 37 for suction, by that buoyancy, this vapor will flow into said ring current way 39, and will be led to a fuel tank 13 through said vapor return path 16.

[0023] Here, even if said vapor was moved so that it might flow into said suction way 33a side, invasion to said suction way 33a is prevented for this vapor by the surface tension generating member 41, consequently mixing of the vapor to the inside of an injection fuel is prevented.

[0024] In addition, many configurations, a dimension, etc. of each configuration member which were shown in said each operation gestalt are an example, and can be variously changed based on a design demand etc. For example, although the example which covered opening of suction section 33a and formed said surface tension generating member 41 was shown, the introductory way 42 which followed said suction section 33a is formed along the tangential direction of a cylinder 33, edge opening of this introductory way 42 is covered, and you may make it form the surface tension generating member 43 in the 2nd operation gestalt mentioned above, as shown in drawing 4 . By considering as such a configuration, the installation location of said surface tension generating member 43 can be set as the location of arbitration, and said surface tension generating member 43 can be installed in the large location of the ring current way 39, and the configuration setup can be made easy, and installation can be made easy.

[0025]

[Effect of the Invention] Securing the amount of supply of a fuel by the surface-tension generating member, when vapor and air bubbles are mixing into the fuel supplied to a fuel supply system according to the vapor stripper in the fuel-supply system of the internal combustion engine concerning this invention, as explained above, passage of said vapor and air bubbles can be prevented and it can prevent that these vapor and air bubbles are sent into a fuel supply system. And it is agitated by vibration etc., and when the fuel sent into said fuel supply system cannot perform separation of the vapor or the air bubbles which are mixed by the buoyancy, even if there is, it can prevent invasion to the fuel supply system of these vapor and air bubbles.

[Brief Description of the Drawings]

[Drawing 1] It is the outline block diagram of the fuel-supply system concerning 1 operation gestalt of this invention.

[Drawing 2] One operation gestalt of this invention is shown and it is the operation explanatory view of a surface tension generating member.

[Drawing 3] The 2nd operation gestalt of this invention is shown and it is drawing of longitudinal section of a fuel supply system.

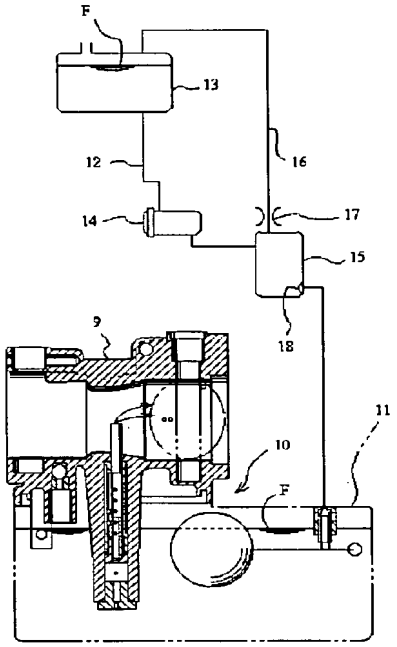
[Drawing 4] The modification of this invention is shown and it is the cross-sectional view of a fuel supply system.

[Drawing 5] It is the outline block diagram showing the 1 conventional example of a fuel-supply system.

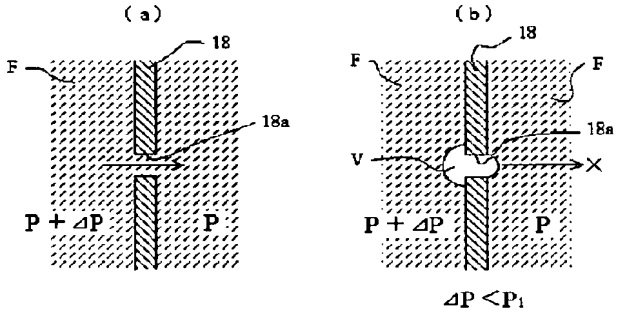
[Description of Notations]

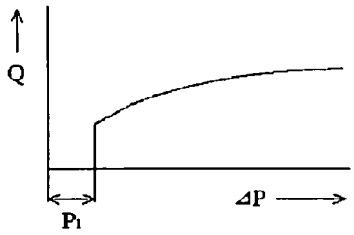
1 Carburetor
2 Fuel Tank
3 Float Chamber
4 Fuel-Supply Path
5 Fuel Pump
6 Vapor Separate Tank
7 Vapor Return Path
9 Main Body
10 Carburetor (Fuel Supply System)
11 Float Chamber
12 Fuel-Supply Path
13 Fuel Tank
14 Fuel Pump
15 Vapor Separate Tank (Tee)
16 Vapor Return Path
17 Drawing
18 Surface Tension Generating Member
18a Pore
30 Fuel Injection Equipment (Fuel Supply System)
31 Body
32 Injection Nozzle
33 Cylinder
33a Suction way
34 Pressurized Room
35 Plunger
35a Exhaust passage
36 Solenoid Coil
37 Contact Pipe for Suction
38 Contact Pipe for Return
39 Ring Current Way
40 Inlet Check Valve
41 Surface Tension Generating Member
42 Introductory Way
43 Surface Tension Generating Member
F Fuel
P Plunger pump
V Vapor

[Drawing 1]

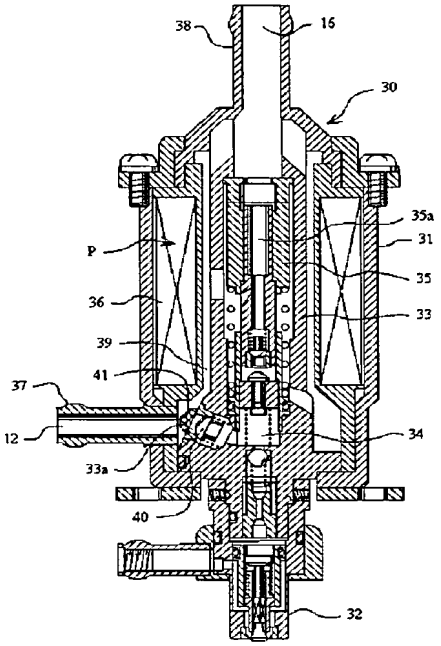



[Drawing 2]

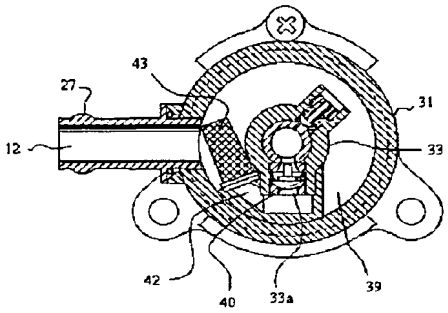


[Drawing 3]




[Drawing 4]




[Drawing 5]